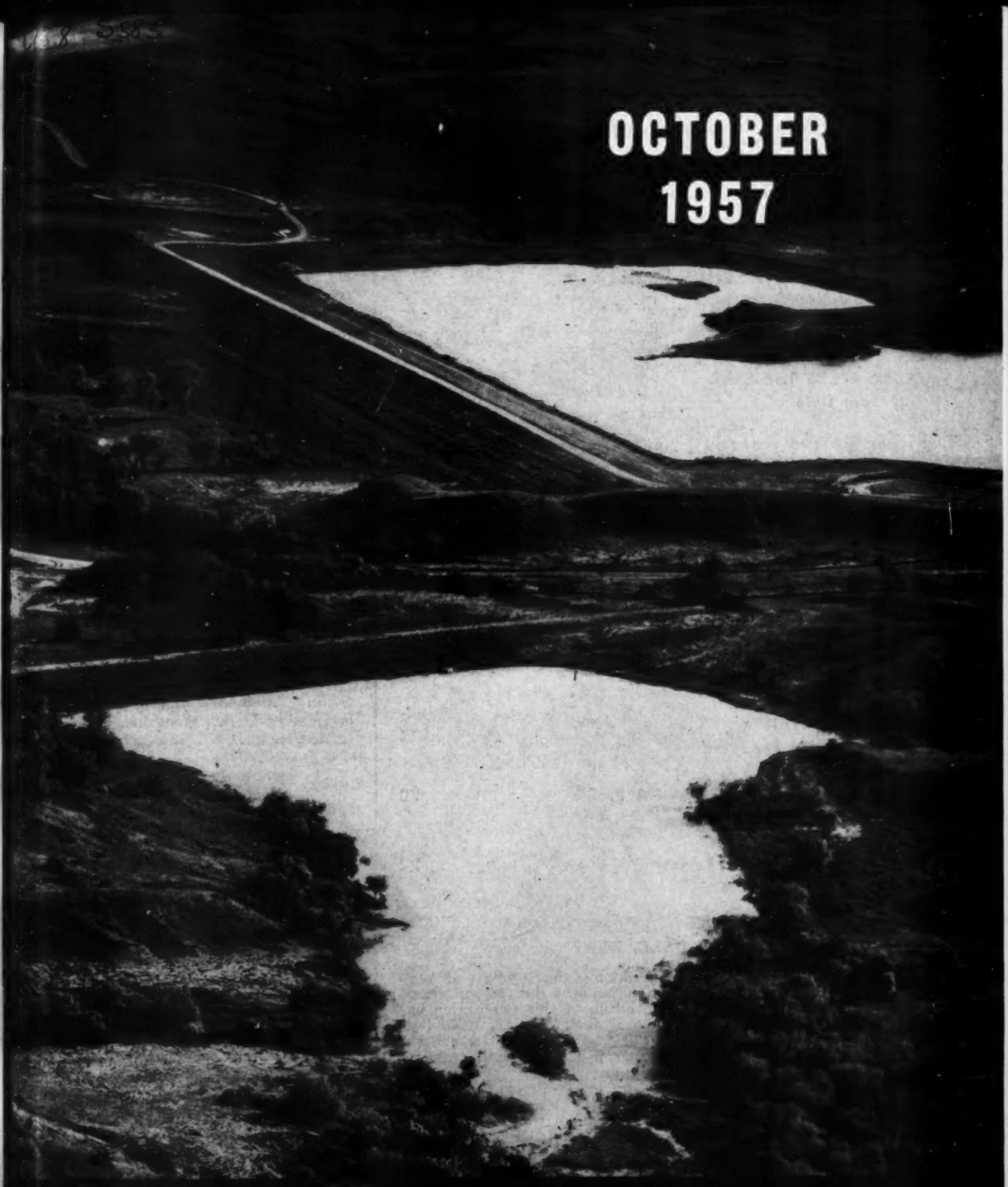

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SOIL CONSERVATION

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SOIL CONSERVATION

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★ THIS MONTH ★

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TOM DALE, Editor

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MULTIFLORA ROSE.—A satisfied district cooperator recently wrote the SCS office at Danbury, Conn., as follows:

"About 10 years ago you made a survey of my farm. Among the recommendations you made was one that I convert a long, narrow field into a pasture. The Still River formed a natural boundary on one side and the opposite side, almost half a mile long, was bounded by Town Road. Along that side you recommended planting multiflora roses and various government agencies furnished me 1,000 or more small plants.

"I frankly had very little confidence that these plants would form a barrier for my Angus cattle. However, the project has been a complete success and I thought you would like to know it."

Editors are invited to reprint material originating in this magazine.

FRONT COVER.—Floodwater-detention dams in the Sandstone Creek Watershed, Okla., after heavy spring rains of 1957. The creek stayed within its banks, though nearby streams were flooding.

—Photo by Robert B. Branstead

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Under All Is The Land

A County That Is Rapidly Being Urbanized Uses Its Recent Soil Survey for Planning Suburban Development, as Well as for Conservation Farm Planning.

By TOM DALE

TOM JOHNSON, a retired Government worker, decided to supplement his meager income by raising some vegetables in his back yard. He had almost half an acre of fairly level ground behind the new home he had purchased recently. The surface soil was a reddish-brown color and looked as if it might be very fertile. But when Tom tried to plow the ground he found the soil to be a soggy clay that was impossible to cultivate. Too early in the spring, he thought! He waited a month, then after a 2 week's drought, tried again. It was still soggy wet with a trickle of water oozing off the surface onto his neighbor's backyard.

He called the county agent for advice. A few days later the county agent came by, took one look at the seepy yard, and said: "I see your septic tank is giving you trouble. They nearly all do in soil of this kind."

Johnson wanted to know what he could do about it. The county agent couldn't give much encouragement. Johnson could enlarge his septic tank disposal field at a cost of a few hundred dollars; but, that would help only slightly, because the subsoil was practically impervious. The home was so far away from existing water mains and sewer lines that it might be years before city-type sewage disposal would be practical.

In the meantime, Tom and his neighbors must live with a sewage disposal field on the surface of their backyards. The stench may be pretty strong during hot summer days. The unsanitary conditions are obvious. But all the county health department could recommend was that Tom and his neighbors use less water in their kitchens, laundries, and bathrooms.

Then, there is the case of Max Bader. He bought a home in a new development on the flood plain of a small creek. The realtor who sold him the home assured him, truthfully, that the area hadn't flooded in 20 years. But Bader's basement was filled with muddy floodwater the first spring after he moved into the house. He was angry, and the realtor was perplexed. They hadn't taken into consideration the fact that hundreds of new homes had been built in the creek watershed, during the past year. All of the shingled roofs, the bare yards with their heavy clay soils, and the paved streets shed runoff water into the creek as rapidly as the rain fell. So, the creek flooded the area for the first time in more than 20 years; and it continues to do so with each heavy rain.

That was the beginning of Tom Johnson's and Max Bader's education about how soils may affect the suburbanites. They were former city dwellers who wanted to get away from the hustle and bustle, yet remain within commuting distance of a big city. They lived in Fairfax County, Va., only 10 to 20 miles from Washington, D. C.

Johnson and Bader were among the vanguard, who led the postwar rush away from the big cities to the suburbs. They moved farther and faster than water mains and sewer lines could be constructed. They tried to solve their sanitary problems with wells, electric pumps, septic tanks, and other improvisations. Many succeeded in doing so; some because they were lucky; a few because they knew about the soil on which they were building. But many, like Johnson and Bader, found they couldn't have the pleasures of country living and the modern conveniences of the city, because the land on which they built their homes was not suitable for suburban development.

Joe Beard, Fairfax County agent, points to septic tank spreading field in impermeable soil.

There are thousands of other suburbanites in Fairfax County who have had similar experiences; in fact, there are more than 2,300 septic tanks like Tom Johnson's. The population of this county has grown from 40,000 in 1940, to 185,000 in 1957. The county government budget increased from $600,000 in 1940, to $22,000,000 in 1957. The board of education must build 200 new classrooms each year to provide minimum facilities for the crop of schoolchildren that materializes annually. In other words, Fairfax County is one of the areas that has been feeling the full impact of the suburban movement during the past decade. The growing pains have been severe at times, and there seems to be no letup in the growth process in the immediate future.

Yet, Fairfax County cannot be considered an exception. There are hundreds of other counties in the United States that have been having similar growing pains, to a greater or lesser extent. Montgomery, Prince Georges, Baltimore, and Howard Counties, Md.; Suffolk, Norfolk, and Middlesex Counties, Mass.; Wayne, McComb, and Oakland Counties, Mich.; Bergen, Essex, Union, and Camden Counties, N. J.; dozens of counties in Ohio and Pennsylvania, and a hundred or more in the Midwest, Southeast, Southwest, and along the Pacific Coast; all are undergoing the transformation from rural to suburban to urban areas.

The main distinction Fairfax County can claim is that county officials have recognized that the suburban and urban developments of their county must be based on the same land that formerly supported an almost wholly agricultural economy. It is not just a matter of having suitable soil for septic tanks. The foundation base for buildings, streets and highways, and other structures is the soil or the parent material lying under it. The growth and well-being of lawns, ornamental shrubs, and trees are largely dependent on the original soil of the planting sites. The runoff from heavy rains that may tax storm sewer facilities or cause flooded basements is greatly affected by the soil type on which the rain or snow falls. The value of any property, whether it be a farm, a suburban home, a factory, shopping center, or paved highway is determined to some extent by the character of the land on which it rests.

Suburban home owners are not the only ones who suffer from building on unsuitable soil. The architects, engineers, boards of education, and even the real estate salesmen also have made grievous mistakes. In Fairfax County, the board of education acquired a tract of land for a new school building without having a proper knowledge of the soil conditions. After the school was started they found that the soil was unstable. It cost the county more than $200,000 to stabilize the footings of the building. A later soil survey showed that the building could have been located a few hundred yards away without the extra cost of abnormally large, reinforced concrete footings.

Road builders have met with many failures because they didn't analyze properly the type of soil on which they were building. Builders of suburban shopping centers have also had some sad experiences. Yet, it is a relatively simple matter for an experienced soil scientist, with proper equipment, to determine the capabilities of any type of soil—whether for farming, road building, septic tank disposal, foundations for large buildings, underground utilities, or other uses.

Why have so many people failed to consider the soil on which they were building? Most progressive farmers know that you must consider the capabilities of the soil in farming operations. They plan accordingly. But too many of us seem to think that soil type is something that only a farmer needs to take into account. Soil is soil; only the location matters! Pick out a location that suits you, then buy a lot and build there, has been the procedure all too often. Some were lucky while following this formula. Others were greatly disappointed.

Joe Beard, the agricultural agent of Fairfax County, recognized the need for a detailed soil survey as early as 1938. He requested a survey for the entire county at that time. He was thinking mainly in terms of farm planning. He did not realize that the postwar-urbanization movement was going to sweep across half of his county within less than 20 years. He didn't get the survey then but he kept the matter in mind all through his service in the armed forces during World War II. He returned to his old job in Fairfax County in 1946.

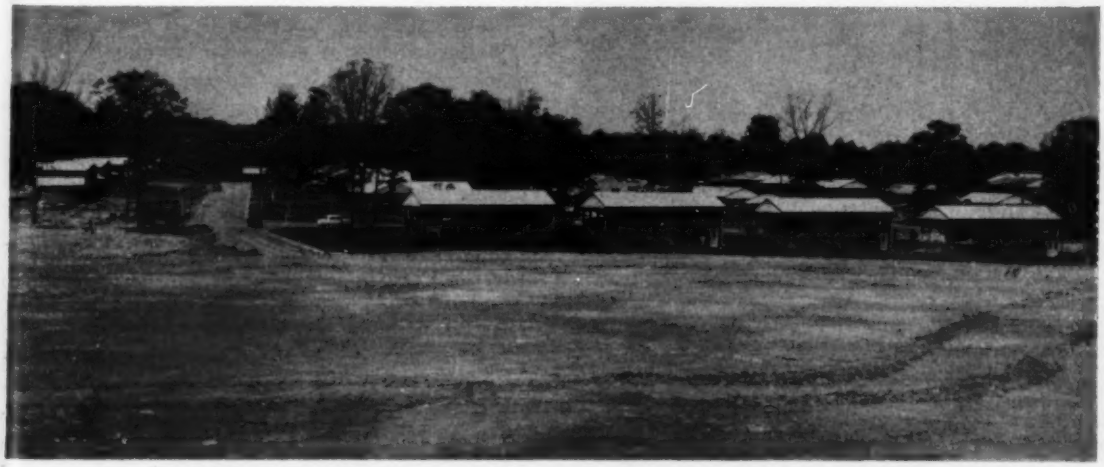
Soon thereafter, the county hired a firm of planning consultants from New York to help develop a master plan for the county. Among other recommendations, the consultants urged a detailed soil survey for suburban planning as well as for farm planning.

Soil surveys were being made by Soil Conservation Service soil scientists on many farms cooperating with the Northern Virginia Soil Conservation District. But this piecemeal survey work was not adequate for county planning. The 1938 request for a new soil survey still lay in the files of the State experiment station. In the meantime, suburban developments were encroaching at an accelerating rate across the county. It was during this period that Tom Johnson, Max Bader, the board of education, and thousands of others had their sad experiences.

By 1951, the county planning commission and board of supervisors realized that a detailed soil survey would greatly simplify their planning and zoning problems. The county health officer also became interested, mainly because of the sanitation problems resulting from such septic tanks as that of Tom Johnson. It was then that Verlin W. Smith, a member of the Zoning Appeals Board and a civic leader, teamed up with Joe Beard to try to push the soil survey.

Smith and Beard began to badger the Soil Conservation Service and State experiment station for action on the 1938 request. Both the SCS and experiment station were reluctant to commit a large amount of their limited funds for a survey in a county that was rapidly becoming urbanized. Many other rich agricultural counties also were insisting on early priority for badly needed soil surveys.

After much persuasion Smith and Beard got



Flood plains of small streams are frequently developed as suburban homesites because the initial grading of such lands is less expensive.

the Federal and State agencies to agree to budget a small sum for soil survey work in Fairfax County. But it would have taken 5 or 6 years to complete the survey at the rate these agencies were willing to allocate funds. That was too long. The county planning commission and board of supervisors wanted to make a comprehensive plan for the continuing rapid growth predicted by planning consultants. They didn't want their county to just grow like "Topsy"; and that is largely the way it had been growing. They figured that a sound plan should be based on the land, according to what each tract was suited for. The director of public works and the tax assessor also became interested.

With the backing of other county agencies, and the supervisors of the Northern Virginia Soil Conservation District, Smith and Beard made a plea to the board of county supervisors, the group that controls county finances. They asked the supervisors to allocate $15,000 each year for 2½ years to complete the soil survey. The supervisors agreed, and early in 1953 the survey was started.

H. C. Porter, a joint employee of SCS and the State experiment station, was the survey party leader. He was assisted by 3 to 5 other soil scientists, as available. More than 300 square miles of the county were surveyed, acre by acre, patch by patch, and farm by farm, according to the most recent standards of the national soil survey. And, while making the survey, Porter and his crew spent many hours at educational meetings with local groups, such as citizens associations, farmers, garden clubs, PTAs, church groups, chambers of commerce, civic clubs, fiscal study groups, planning groups, and others.

C. S. Coleman, county soil scientist, looking up soil information for county citizen.

When the survey was completed, transparent overlays were made and duplicated for each sheet of the detailed soil survey map. These overlays show all pertinent soil information. A sheet of one of these overlays may be placed over a corresponding sheet of a property identification map and the soil conditions of any specific tract quickly determined. A detailed description of each soil separation, including the land capabilities for agricultural or other use, was prepared and mimeographed. Thus, any agency or person wanting to know about a specific tract of land may quickly obtain full information about the soil type and the capabilities of the land.

When the soil survey information became available, even Beard and Smith were surprised at the number and variety of users. Nearly all agencies of the county government found some uses for the information. In addition, real estate developers and numerous individuals and groups of citizens flocked to the county agent's office to get information about specific tracts of land. And, of course, the SCS technicians working with soil conservation district cooperators were relieved of further worries about getting soil survey information for conservation plans.

Beard soon found that he couldn't properly handle all requests for soil information. So, the county supervisors hired a soil scientist to devote all his time to interpreting the soil survey for the various government agencies and citizens of the county.

E. F. Henry, a soil scientist on the State experiment station staff, was hired as county soil scientist in the fall of 1955. He became the first full-time soil scientist hired wholly by a county government in the United States. For the 18 months he filled the job he was one of the busiest employees of the county govern-

About 50 percent of Fairfax County is classed as farmland; dairying is the main farm enterprise.

ment. Henry became so well known and his reputation as an interpreter of soil surveys so highly regarded that he was hired by the Federal Housing Administration in Washington, D. C., as a soil scientist. His successor, C. S. Coleman, is still one of the busiest men around the Fairfax County courthouse.

The county health officer and his assistants are among the most frequent users of soil survey information. The sanitation branch of the health department refuses to OK a septic tank site unless the soil is suitable. During the past 2 years, the soil scientist and health department have run percolation tests on more than 1,000 soil sites in the county. As a result, they know just what to expect in the way of percolation on each of the 107 different soil separations of the county.

The planning commission and zoning board frequently examine the soil map and consult the soil scientist before making decisions about zoning, whether for residential, commercial, or public uses. In some cases the zoning edicts, resulting from soil survey information, have caused temporary hardships to individuals and groups.

For example, a real estate developer bought a 100-acre tract of land from a farmer for $600 per acre. Two paved highways passed nearby; the view was good. The developer put up a temporary office building on the tract and hung out a sign advertising lots for sale. Then he went to the county courthouse for what he thought was the formality of getting his 100 acres zoned for residential development.

The developer received a rude shock when informed that the soil on nearly all the tract was utterly unsuited for septic-disposal fields. The soil was Iredell silt loam, almost impervious. The land could not be zoned either for residential or commercial development until the developer installed adequate water and sewer systems. It was 12 miles to the nearest water supply that could be called adequate. It was almost as far to the nearest site where sewage disposal was practical. The office building and sign were taken down; the 100 acres remain a rather poor pasture, worth, perhaps, $100 an acre.

The real estate developers in Fairfax County seldom make such mistakes now. They go to the soil scientist or planning commission to find out about soil suitability before they invest in land at inflated prices, regardless of whether paved roads and other attractions are close by. Home buyers in Fairfax County also consult the soil scientist. In fact, most people in Fairfax County are now soil conscious. They have been educated to the fact that the land is the base on which they must build and live.

Recently, the board of education was pressured by a group of citizens to build a schoolhouse on the fringe of their community. The soil map showed that the site was not suitable for heavy building construction. And, more important, the soil of the neighborhood was unfit for septic disposal; it could never be developed for residential purposes until expensive water and sewer systems were installed. The school was built; but it was built a half mile away, on soil that was suitable for both schoolhouses and homes.

The director of public works and the planning commission were called on to select a site for a sanitary land fill (county dump). The site was chosen; but, nearby residents told the engineer that solid rock lay only a few feet below the ground surface. The soil map indicated that the rock was a soft schist that could be easily excavated with bulldozers and other equipment owned by the county. A few test borings showed this to be true. The county dump was located at the selected site, in spite

About 25 percent of Fairfax County is weed- and brush-covered idle land, interspersed with urban and agricultural land.

of local objections, because it was the logical site according to long-range plans of the county.

The public works director also uses the soil map in planning construction of new roads or improvement of existing roads. The map shows where soil is suitable for a stable road base, and where cuts and fills can be made without undue expense. Even more important, the soil map shows where borrow pits, with soil suitable for large fills, can be located.

The tax assessor is also a frequent user of the soil survey. No longer does he consider just the location and improvements on a tract of land to determine its assessed value. The soil map is the base from which he starts. The potential productivity as farmland is of prime importance on the 50 percent of the county's land that is still farmed. About 25 percent has been urbanized, and is assessed mainly according to the value of the improvements. But, about 25 percent of the county is properly classified as idle land.

How do you assess idle land, covered with a scattering of scrub timber and brush? It brings no income to the owner. Nearly all of it, in Fairfax County, is held for speculative purposes—waiting for the urbanization development to inflate the price. The Fairfax County assessor has a formula for these lands: he assesses them mainly on soil type and location. If the soil is suitable for suburban development and the location indicates possibilities of development in the near future, the scrub timber and brushland gets a high assessment. A nearby tract, with soil unsuitable for suburban development, may get a much lower assessment.

Several other suburban counties, in various sections of the country, have up-to-date soil maps. In most instances, however, the soil maps are ignored, so far as suburban development is concerned. The maps lay in the files of local libraries or in the county agent's office, except as they are used by SCS technicians and farmers in developing conservation plans.

Much of the interest shown by Fairfax County people in soil capabilities is due to the educational work done by the soil survey crew, and later by the county soil scientists. The accessibility of the soil survey information and the availability of a soil scientist to interpret it also contribute much toward more general use. Furthermore, the fact that the county governing body was willing to pay more than half the cost of making the survey, from a tight county budget, tends to encourage county officials and others to use the survey information.

Some county officials claim that the Fairfax County government has already saved many times the cost of the survey on public structures alone. In addition, the savings and conveniences to citizens of the county have been enormous.

FUTURE OF THE SOUTHERN GREAT PLAINS

No. 28

This is the twenty-eighth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By H. H. FINNELL

THE southern Great Plains is an area of potentially great soil resources, but agriculture has not yet been adapted to the hard facts of the physical environment. Already, several false starts have been made in the agricultural development of this area.

Men go through life reacting to environment whether they are conscious of it or not. Some lessons are learned more easily than others; but, mistakes must be recognized as such, if we hope to avoid the consequences of repeating the same errors over and over. When we undertake to manipulate natural forces, what has to be done, will be done. Whether we do it intelligently may depend on how well we understand the necessities of our environment.

During the thirties, the principal effect of drought was crop failure, which, in turn, caused dust storms that attracted wide attention. When the people realized they were up against something for which they did not have a ready remedy, the newly expanded dryland farms suffered considerable outright abandonment. This was of far-reaching consequence and might have pointed toward a final permanent adjustment but for other events that intervened.

Now, during the fifties, another drought is in progress. The year 1956 was the sixth consecutive year recording less than average rainfall in the southern Great Plains. The dust storms have been comparable to those of the thirties in frequency and soil movement, but have not caused widespread land abandonment.

The striking feature of the present period is the switch from dryfarming to irrigation wherever ground water has been available for pumping.

How long we can continue to anticipate new and different consequences of drought is hard to say, but it may be constructive to appraise the land-use adjustments that prevailed in the past. Those of the nineties and "teens" meant little because at that time the full production potential of the land was not being utilized. The abandonment in the thirties of soils too shallow or too sandy for continued cultivation was a logical step. Some of this adjustment stuck; but, unforeseen conditions—favorable moisture and the wartime market—stimulated a reverse action during the 1940's.

In the southern Great Plains one of the well recognized natural features of the environment is drought. Every time this area has a severe drought someone is sure to be heard saying, innocently, that it is unprecedented in history. This is not so hard to understand when we notice that the long droughts have been spaced just about far enough apart for each to be faced by a new generation of people.

The severe droughts that normally come to the Plains are not something to be treated lightly. Each one, within recent times, has proved to be a major event affecting the course of land development. The memory of "old-timers" still living on the Plains goes back through three or four of these events. These old-time residents have a different story about the consequences of each one; but the weather records show the droughts to have been substantially alike in severity and duration.

There are understandable reasons why the actions of landholders with respect to drought have changed from time to time. During the

Note:—The author is research specialist, soil and water research division, Agricultural Research Service, U. S. Department of Agriculture, and assistant director of the Oklahoma Experiment Station, Goodwell, Okla. From 1934-42 he was regional director of the Soil Conservation Service for the southern Great Plains.

nineties and "teens" the principal effect of drought was a shortage of grass, since not much cultivation was being done on the Plains then.

These droughts were acutely felt by heavily stocked cattlemen, and some consolidation of range holdings took place. This was not a far-reaching movement, however, because exploration of the land by small farmers was already in progress.

Experience proved that the dryfarming expansion of the twenties was not so much overdone as it was misdirected. The settlers did not use sufficient discrimination in their choice of land for tillage. In other words, they plowed considerable land that was not suitable for cultivation while leaving some cultivable land in grass.

The same indiscriminate kind of expansion took place in the forties, when nearly 6 million acres of marginal and submarginal land were put into cultivation (mostly in eastern Colorado, New Mexico, and western Texas; and, to a lesser extent, in western Kansas and Oklahoma). Compared with the plowup of the twenties this expansion was both overdone and misdirected.

The drought-triggered readjustment in progress now is two pronged. Along the arid margin of the Plains considerable abandonment of low capability land is taking place. In the marginal zone, the most ambitious effort to meet the drought situation has been to develop irrigation by pumping from wells.

Land abandonment was a common feature of the dust bowl of the 1930's.

The southern Great Plains have long been recognized by agriculturists as a broad belt of territory that has greater soil productivity than that of the natural moisture supply.

To the dryland farmer this presented the inviting prospect of reward for efficiency in water management. During the twenties, farmers and soil scientists alike were fired with enthusiasm by the quest for practical water conservation methods. Even in this early stage of dryfarming development, wheat production was such to encourage the spilling over of land settlement into the marginal zone along the arid western fringes of the Plains.

The drought of the thirties was a normal change but it caught the farmers unprepared for the problems of wind erosion. The consequences are well remembered as the "dust bowl" experience of the "dirty thirties." A land-use adjustment was made then to suit the hard necessities of natural conditions. Soil deterioration and the abandonment of cultivation were more prevalent on low capability lands in the marginal zone. Likewise, it was there that recovery was most spectacular during the normal turn toward a more favorable run of seasons in the forties.

Easing the strain of trying to maintain precautions against dust storms not only restored the land boom attitude but the wartime market enabled many of both the older and newer settlers to pay off their mortgages. This clearing the land of obligations came just in time to make way for the new venture of investment in irrigation wells.

Well pumping for field-crop irrigation has been practiced in shallow water areas of the southern Plains country for nearly half a century. The drought of the thirties stimulated expansion of irrigation into adjacent, not so shallow, areas. When drought again threatened early in the fifties a further extension of well-pump irrigation started in deep-water areas.

Until now the lowering of the water table, as the deposit of ground water was gradually pumped, has been offset by new, more efficient pumping equipment, by cheaper fuel for power,

Pump irrigation from underground water has been a popular method of solving the drought problem of the 1950's.

by gaining skill in the more productive use of water, and by the introduction of more valuable specialty crops. Even so, some farm-irrigation areas have lately come into fierce competition with municipalities for the use of ground water stores.

Theoretically, the ground water supply is a naturally renewable resource. However, it is an exhaustible deposit as used in the southern Great Plains. The demonstrated rate of natural recharge is so slow that we might as well treat this deposit of water as we would an oilfield, so far as irrigation agriculture is concerned.

In many irrigated counties the water table is now down 60 to 80 feet below the level at which pumping was started. This means that in some areas, as much as half of the available ground water store has already been used. It means further that the remaining supply must be lifted at least 60 to 80 feet higher to get it out of the ground.

The simple arithmetic of pump irrigation is illustrated by the situation in the Oklahoma Panhandle, where deep well irrigation is developing rapidly on a limited ground water supply. In some localities the underlying charged water sands are 100 to 150 feet thick. Water yield is 15 percent. Total available water in store is 15 to 22.5 feet.

If used at a minimum rate for supplemental irrigation of 1 foot per year on one-fourth of the land area, the total supply would last between 60 to 90 years. (Some areas have water sands up to 500 feet thick, but the cost of lift from deeper strata may become a practical limitation.) In this example, three-fourths of the land would still be subject to dryland management.

If, however, a county, or even just a community, were seeking to eliminate completely its drought problem by irrigating 100 percent of the land, it would find its ground water had disappeared in 15 to 25 years unless it could receive some inflow from neighboring undeveloped areas.

Well-pump irrigation, as either a complete or a partial solution for drought, must be recognized as only a temporary expedient in the long-time agricultural life history of the southern Great Plains.

This puts the burden of long-time production on dryland farming. It is for this reason that whatever tradition of dryland farming we have should be preserved and a special effort needs to be made to perfect the techniques of dryfarming as applied to the southern Plains. This large body of fertile soils literally has no long-time future except for dryfarming.

The limitations of water resources and their use are part of the hard facts of nature, just as are the limitations of land capability. In a dryfarming economy, conservation farming is the only thinkable starting point for a permanent agriculture. The gist of the matter is: any permanent solution must include a sharp discrimination in land use that concentrates intensive tillage on the high capability land and lets nature have her way on hard to manage lands.

The only way, apparently, to conform gracefully to the necessities of southern Plains environment, is to take the long-time viewpoint.

It's The Rain You Keep That Counts

By D. A. WILLIAMS

RAINS that broke the drought in the southern Great Plains last spring proved again that soil- and water-conservation practices help farmers and ranchers equalize the effects of climatic extremes.

Where President Eisenhower in January made a personal inspection of drought damage, farmers in May and June found their fields too wet to harvest grain or till row crops. In the lowlands downstream the Red Cross and other relief agencies ministered to flood victims.

Nevertheless, by midsummer crops in some fields were withered for want of moisture, while foliage in neighboring fields was lush and green. On many ranches, the young grass and tender weeds that had been started by the rains lay parched and brown beneath the summer sun.

Conservation treatment on the land made the difference. Cropland and pastures that were protected by plant cover or other good conservation practices readily absorbed a large part of the drought-breaking rainfall. Unprotected land, on the other hand, shed the water into streams and rivers, helping to produce an unprecedented series of damaging floods.

Alert soil conservationists in drought-conscious Texas documented the story by hundreds of moisture-penetration observations in late May. In all parts of the State, whether 1957 rainfall had amounted to 2 inches or 40, they consistently found the soil wet to greater depths in fields and pastures that had good cover or other protection than where the soil was bare or untreated.

Technicians in more than 120 work units dug holes or made borings to see how deep the soil was wet. The field checks included 133 paired observations comparing protected and unprotected land under otherwise similar conditions. Forty of the contrasting pairs were on cropland, 93 on range or pasture; 64 were in areas that had received more than 12 inches of rainfall since January 1; 69 had received from 2 to 12 inches.

In all but three cases, the land with cover or other conservation treatment was wet to greater depth than the same soil nearby without such protection. In two of these three cases, insoak was the same. The lone exception, on terraced cropland, is unexplained, but probably was due to an impermeable plowsole.

Although there was great variation in depth of penetration under the widely different soil and rainfall conditions, on the average, insoak was twice as great on protected land as on unprotected. Where rainfall exceeded 12 inches, average depth of penetration was 55 inches on protected land and 29 inches on unprotected land.

This meant that cropland or grassland with good cover or conservation treatment was wet to the full depth of the normal root zone (4 to 6 feet) wherever enough rain had fallen to wet dry soil to that depth. Bare or unprotected land, by contrast, was still dry in the lower root zone and crops or grass soon suffered where rain had not come at frequent intervals during the summer.

Twenty out of 25 fields of cropland that had received more than 12 inches of rainfall were wet to below 48 inches where protected by conservation practices, but only 11 were wet to this depth where unprotected. In 39 comparisons of rangeland, 28 of the protected areas, but only 4 of the unprotected were wet to 36 inches.

The benefits of conservation were apparent in deeper moisture penetration on all soil types examined. In fact, area conservationists who summarized the observations repeatedly com-

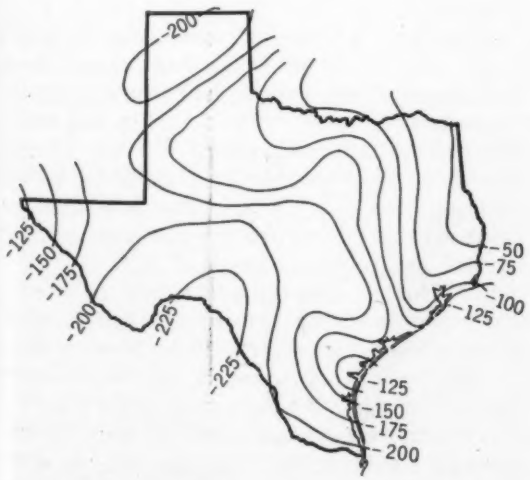
mented that cover and condition of the surface soil seemed to have more effect on the amount of water absorbed than did differences in soil types.

In 77 comparisons of land with and without cover, moisture penetration averaged about 1½ times as deep on cropland with a cover as without, and about 3 times as deep on rangeland with good cover as that with poor or no cover.

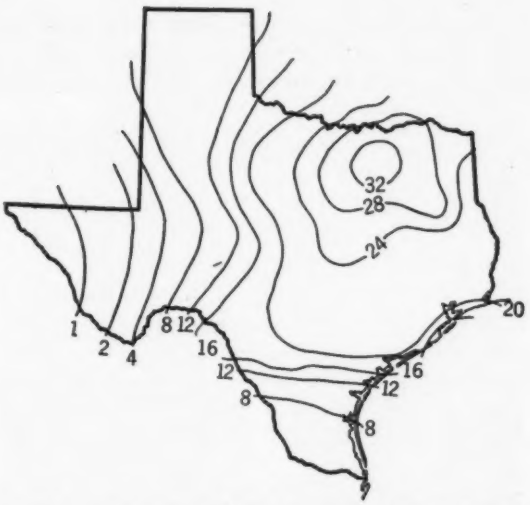
One of the unexpected findings in Texas was that cropland generally absorbed more water than rangeland. Where rainfall exceeded 12 inches, average penetration under conservation protection was 72 inches on cropland compared to 45 inches on rangeland. Without protection, the average penetration was 45 inches on cropland and 29 inches on rangeland.

We have been accustomed to thinking that grassland, simply because it is grassland, permits less runoff than cropland. But the observations in Texas indicate that the amount and *condition* of the cover can have more influence on insoak than whether the land is used for crops or pasture.

J. L. Richmond, area conservationist at San Angelo, explained it this way: "Cropland had better moisture penetration than pasture in most cases. This was due to the poor cover that was on most of the rangeland in the area. The cropland as a whole was deep-listed and contoured. This deep-listing and contour-furrowing held most of the rainfall and allowed for better penetration."



Deficiency of precipitation in Texas for 5 years (1952-56) in percentage of normal precipitation for 1 year.



Total precipitation (inches) in Texas, March through May 1957.

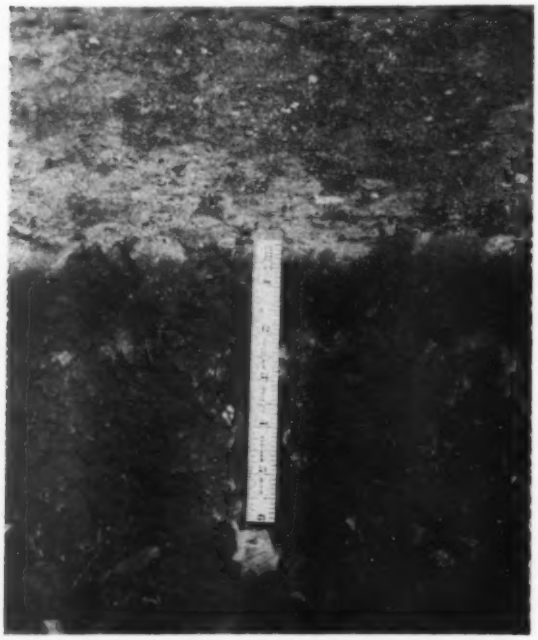
Because of the extended drought, most rangeland had only sparse cover even where it had been moderately grazed during the past 2 or 3 years. Most range soils in the southern Plains crust when the surface is exposed to rain and sun. The prevalence of this condition caused high rates of runoff from rangeland not protected by good cover or special conservation practices.

"Moisture penetration on cultivated land shows a close correlation to the amount of good conservation practices on the land." This statement by James D. Abbott, area conservationist at Lubbock, sums up the observations on cropland. He estimated that in the High Plains area, where he works, approximately 60 percent more penetration occurred where good practices were in effect than where not.

Cultivated land with a cover crop on it usually was wet 1½ to 2 times as deep as similar bare cropland. Cover also protected the land from washing during the hard rains.

"Good agronomic treatment with legumes and small grains for periods of 5 years or more without row crops has proved to be as effective as fair native grass cover for getting depth of moisture penetration," Area Conservationist, D. C. Larner of Terrell reported.

"It was very noticeable," said John W. Herring, Jr., area conservationist at Alice, "that on land that had cover there was much less damage than on land that was bare or in a row crop."



Moisture penetration from .95-inch rain on bare range (above) was 2 inches; on range with short-grass cover (below) was 5 inches.

Cropland with a mulch of stubble or residues absorbed up to twice as much moisture as land without this protection. Stubble mulch also reduced erosion.

"The management of crop residues has again proved its value in control of water erosion and wind erosion following rains," W. S. Goodlett, area conservationist at Big Spring, observed.

"Even flax stubble provided considerable aid in protecting the soil from raindrop splash," area conservationist Herring reported.

Moisture penetration was usually 1½ to 3 times as deep on terraced and contour-farmed cropland as on similar land without these practices.

Insoak was more variable on fields with these mechanical practices than where cover crops or residues were present. In one comparison, insoak was greater on the untreated than on the treated field. Soil was usually wet below the root zone where water had collected above terraces. Other studies have shown that terraces must be correctly built for moisture conservation if they are to increase water intake consistently.

Where a combination of vegetative and mechanical practices was used, treated cropland was wet 1½ to 3 times as deep as untreated land on the same kinds of soil.

Rangeland with good cover was generally wet 2 to 5 times as deep as that with poor or no cover.

After 5 to 8 years of continuous drought, range conditions in Texas had deteriorated badly, even where stocking had been drastically reduced. The "good" cover found in the moisture-penetration comparisons did not always consist of the best forage grasses by which range condition is judged. But any kind of plant growth left on the ground helps protect the soil and increase insoak of rain.

E. J. Hughes, area conservationist, at Brownwood, estimated the percent of rainfall effectively utilized varied from 10 to 90 percent.

"The amount of cover is the determining factor," he said. "We have more cover now (in May) than we have had since the early forties. Annuals dominate the landscape but are serving a purpose."

In the San Angelo area, J. L. Richmond re-

Hubam sweetclover and oats on this field held most of a 14½-inch rain that fell in 24 hours. Water did not flow through the emergency spillway of the water-retarding structure below.

ported, "The ratio of moisture penetration for rangeland in fair to good cover as compared to poor cover and bare ground is 3 or 4 to 1."

In the absence of good cover, tillage treatments of rangeland increased insoak.

Pitting and chiseling increased depth of penetration 2 to 4 times that on similar untreated land. These practices are used most in the drier range areas. The tillage breaks the crust of bare range soils, permitting storage of enough moisture from small rains to make them effective in starting plant growth.

Root-plowing is used to remove worthless brush from depleted south Texas ranges. The plow consists of a long knife-like blade pulled behind a powerful crawler-type tractor. It cuts the roots of shrubs and small trees and breaks up the soil to a depth of 8 to 16 inches. Grass seed usually is planted at the same time or immediately after root-plowing.

Moisture penetration on root-plowed land was 2 to 6 times as deep as on unplowed land. Greatest insoak occurred where grass had been seeded and the root-plowed land had good cover.

Area Conservationist, John W. Herring Jr. reported observations on a ranch near Kennedy that indicated 9 inches of water stored in root-plowed land compared to 1 inch of water in untreated bare soil.

"The 9 inches of stored water under the root-plowed land will support enough vegetation this year to maintain good penetration in this pasture," he said.

Land root-plowed a year or more ago and still bare, however, generally was wet little or no deeper than untreated land. In the Uvalde area, Meril G. Carter reported, "Some freshly root-plowed land, which had 4 inches of rain, had 36 inches penetration. Some old root-plowing, which had 4 inches of rain, and had never established a cover, had 14 inches of penetration. Untreated land in the same area with the same rainfall had the same penetration."

Moisture penetration in cropland of Texas, May 1957, where paired fields were adjacent and similar except for conservation treatment.

Treatment	No. of fields	Average penetration
Cover crop	13	60 inches
No cover crop	13	35 "
Stubble mulch	6	40 "
No stubble mulch	6	28 "
Terraced and contoured	8	46 "
Not terraced or contoured	8	30 "
Combination of practices	13	75 "
No conservation practices	13	44 "
All cropland with conservation treatment	**40**	**59 "**
All cropland without conservation treatment	**40**	**36 "**

Moisture penetration in rangeland of Texas, May 1957, where paired plots were adjacent and similar except for conservation treatment.

Treatment	No. of plots	Average penetration
Good cover	64	39 inches
Poor or no cover	64	14 "
Pitted or chiseled	9	26 "
Not pitted or chiseled	9	8 "
Root-plowed	20	35 "
Not root-plowed	20	13 "
All rangeland with good cover or treatment	93	37 "
All rangeland with poor cover or no treatment	93	13 "

These observations help to explain why farmers and ranchers who use good soil and water-conservation practices go through periods of drought with less distress than others. Their fields and pastures go into dry periods with reserves of moisture stored in the soil.

They help explain also how conservation treatments and small dams, already installed on 25 Texas watersheds at the time of last spring's rains, reduced flood damages by an estimated million dollars. In addition to the water detained by the dams, each foot of dry soil made wet by insoak had stored from 1 to 3 inches of rainfall instead of permitting it to run off over the surface. Potential flood hazards were thereby reduced accordingly.

Although land treatment was not complete above all the 173 floodwater-retarding structures that functioned on Texas streams last spring, we can be sure that soil- and water-conservation practices contributed materially to benefits reported from the subwatersheds of the Trinity and Colorado Rivers and from four pilot watersheds.

Even more important to the land owners and operators, the water held in the soil helped to grow crops, forage, and other vegetation during the rainless weeks that followed.

Conservation Cartoonist

By W. H. LATHROP

FELIX Summers, artist in the field cartographic unit, Milwaukee, Wis., recently received a Certificate of Merit and a check for $1,000, highest cash award ever given by the Soil Conservation Service.

Illustrations in ever-increasing number and variety have flowed from Felix's drawing board, but the citation took particular notice of his series of conservation cartoons and of his perseverence above and beyond the call of

Felix Summers

routine orders and office hours. The award was presented by Dr. Austin L. Patrick, at Milwaukee, where Felix is stationed with the cartographic unit.

Fellow SCS workers know Felix best for his series of humorous and philosophical cartoons that have been published throughout the United

Note:—The author is information specialist, Soil Conservation Service, Milwaukee, Wis.

States and in other countries. Many of these have been used on editorial pages and in special newspaper editions. Only recently a printed collection of his drawings was distributed throughout the Service to make them available to all field offices.

Born on an Iowa farm, Felix got his first knowledge of agriculture from the land itself and from the livestock, gullies, and buildings he likes to draw. During the depression he worked his way through the University of Nebraska's School of Fine Arts. Later, he worked on a Wyoming ranch. A scholarship from the Nebraska Art Association made it possible for him to enroll at Yale University. After his course there, he served a year's apprenticeship under muralist Eugene Savage. Then came free-lance work for nightclubs and stores.

When the war came, Felix enlisted in the Army engineers. After the war, with no immediate employment in sight, Felix returned to his old home in Mills County, Iowa. There he joined the Soil Conservation Service as conservation aid under Work Unit Conservationist, Ray Jones. His art career seemed suspended; however, he turned back to his drawing board again. In the evenings he made charts and sketches that would help sell farmers on the practices he planned with them during the day. When some of his work came to the attention of men from the regional office at Milwaukee, he was asked to join the SCS staff there in 1949.

Probably the most widely known of all Felix's drawings is the "Service emblem" which has been used in many ways, even as a postage meter cancellation stamp, and more recently as a Service employees' calling card. One of his popular cartoon series depicts two black crows who make wry comments about the conservation scene.

A PLANT LIVES IN TWO WORLDS, one above the ground surface, the other below. About half of the plant lives in each. Above ground is an environment whose factors are sunlight, temperature, moisture, wind, carbon dioxide, and oxygen, among others. The plant must be suited to these factors or it cannot flourish. If this atmospheric climate changes, plant species must change.

Below the ground surface is an environment whose factors are darkness, moisture, temperature, air, humus, microorganisms, small animals, minerals, and so on. If this soil climate changes greatly, the plant species growing in it must change. It is possible, even common, for the soil climate to change while the atmospheric climate above it does not. One factor which can easily change is moisture. Moisture gets into the soil by the infiltration of water, and the infiltration rate may change radically.

When rain falls on sloping land, it will do one or both of two things: It will soak into the soil or run off. On land that is well covered with vegetation and has a loose, porous soil, with an organic mulch, as much as 99 percent of the rainfall may soak in. Where a slope has been denuded of its porous topsoil by cultivation and continued erosion, the soakage may drop as low as 50 percent. When this happens, there is a definite change in soil climate: it becomes twice as arid. If the atmosphere supplies 20 inches of rain a year, only 50 percent of which soaks into the soil, the plants living there are no better off than if only 10 inches of rain had fallen and all of it had soaked in.

Topsoil and Civilization
TOM DALE AND VERNON G. CARTER

53,000 Jamboree Scouts discover . . .

The Magic of Conservation

By BERNHARD A. ROTH

THE sheer magic of conservation opened the eyes of 53,000 Boy Scouts and leaders at the Fourth National Jamboree during seven, dramatic July days at Valley Forge State Park, Pa. "The Great Conservo," master magician and conservationist, did his stuff, carnival style, under the Big Top, to the shrill piping of calliope music. Rabbits emerged from silk hats, trees shot up out of buckets, and conservation slogans sprang from a magic typewriter.

Then came a color movie introducing the campers to "Our Magic Land." As the film unwound, Scouts learned that even the Great Conservo had to call upon science to guard America's soil, water, forest, fish, wildlife, and mineral resources.

Outside of the tent they moved down the midway through a wonderland of conservation science in action. First, they got a worm's-eye view of soil profiles imported from New Mexico, Nebraska, Wisconsin, Georgia, and Vermont. Then they saw raindrops bouncing specks of soil a foot and a half in the air. And, grassed soil that refused to budge in the rain.

Next, they saw water roaring downhill, pulling naked soil with it, yet unable to destroy contoured furrows and vegetated slopes. In the next booth, the wind was blowing up a gale. A dust cloud hit Scouts' faces when they stood near the uncovered soil. Tiny particles

One of the "Big Tops" at the scout jamboree.

SCS technician explains conservation measures on Stone Valley Watershed to Boy Scouts.

blew from the stubble-mulched land. Yet the land lay serene where a windbreak and shrub buffers took the force of the blast.

Then, they witnessed hillside farms of a small watershed, all falling to rack and ruin because of uncontrolled erosion and runoff. An SCS technician pulled a string and the picture changed completely as conservation practices shot into view.

Nearby, the boys viewed a mammoth 3-D model of Stone Valley Watershed, exactly like the real one in Northumberland County, Pa. To look at the model was like being in an airplane, looking down on 11 beautiful conservation farms. Clear streams of water flowed down outlets from tiny farm ponds, diversion terraces, and ditches, to form a river. At the foot of Stone Valley, a floodwater retarding dam pooled the water a moment, then let it go gently toward the ocean.

A graceful design of contoured stripcrops tied together the farm buildings, roads, bridges, woods, pastures, and the tiny community, into a pattern of watershed conservation.

Leaving the soil and water exhibit each Scout filled a plastic souvenir bag with 8 ounces of hallowed Valley Forge soil. Emblazoned on the bags were a drawing of George Washington kneeling in prayer during the dark days of 1777–78 and the insignia of the National Association of Soil Conservation Districts.

A running stream, 50 yards long, dropping into an 8-foot pool, introduced boys to the fish and wildlife exhibit. Deflectors, barriers, streambank plantings, and log dams showed Scouts how science makes better fish and fishing. Two fawns and a wild tom turkey, that were nestled in the neighboring woods, helped to demonstrate the techniques of making game feel at home in the American landscape. Scouts made note of exemplary models of nesting boxes, shelters, feed bins, and a living nursery of wildlife feed and cover plants.

Scouts at the soil and water conservation exhibit.

Up in Smokey Bear's area, still more of conservation's magic was displayed. Here were the trappings of the forest fire lookout, with model observation tower, spotting maps, wind-gauge, radio-telephone, and the vital danger-meter.

Farther on, was still more of the romance of forestry and the gadgets that Scouts love to handle—woodmen's axes, chains, cruising sticks, and fire pumps. Then, there were displays of how trees grow—big and profitable with conservation—poorly without it. The boys gazed in wonder at sections of massive tree trunks brought in from primeval forests that would tower above some of the tall buildings in modern cities.

The conservation carnival went on, all day, for 7 days, at three widely separated areas in the 2,000 acre Jamboree encampment. Success at maintaining a carnival in triplicate had conservation magic too. The achievement was a result of the working-together spirit of three Federal resource agencies—the Soil Conservation, Forest, and Fish and Wildlife Services; and the State agencies working in similar fields in New York, New Jersey, and Pennsylvania.

A number of private conservation organizations, commercial nurseries, and landscape services helped generously. Free copies of a fascinating and instructive booklet, "Conservation Magic for Boy Scouts," prepared by cooperating Federal agencies and printed by the National Wildlife Federation and the Outboard Boating Club of America, will serve Scouts as a valuable aid in conservation information.

As the multicolored tents disappeared, one by one, from Valley Forge, in much the same manner as they did 179 years ago, someone asked the conservation technicians did the Scouts "get much" out of the show. "I doubt if I'd be hoarse and plumb talked-out from answering questions, if these kids didn't get *something* out of it," replied one exhausted booth-tender.

And that was the consensus of those who took part. Scouts at this Jamboree went after details of conservation information like wolves after a lamb. Maybe it was the Great Conservo's potent magic—maybe it was the carnival atmosphere—maybe young America was truly awakening to conservation of the natural riches their forefathers were careless with.

Only the minds and hearts of an army of Boy Scouts now scattered to the far corners of the United States and other countries hold the answer.

They Didn't Wait

Six Farmers Wanted Flood Protection Now, So They Built Their Own Floodwater Detention Dam.

By WILLIAM L. SHEPPARD

SIX farmers, south of Sylvan Grove, Kans., with Federal and county help, built their own floodwater detention dam on the east branch of West Twin Creek Watershed. The structure is designed to retard the flow of floodwater from a 2,650 acre drainage area above the dam. It will protect 310 acres of bottom land and several farm buildings below the dam from the flood damages that had occurred almost every year.

Note:—The author is work unit conservationist, Soil Conservation Service, Lincoln, Kans.

It was quite an undertaking for 6 farmers, since more than 40,000 cubic yards of dirt had to be moved. The permanent pool above the dam contains 24 surface acres. The floodwater storage is about 350 acre feet. But under a pooling agreement, the Agricultural Conservation Program put up about 75 percent of the cost of construction, while the county furnished some heavy equipment and actually moved about 5,000 yards of the dirt used in the fill. Thus, the out-of-pocket cost to the farmers was only about $1,700. In addition, they contributed much time and labor to the project.

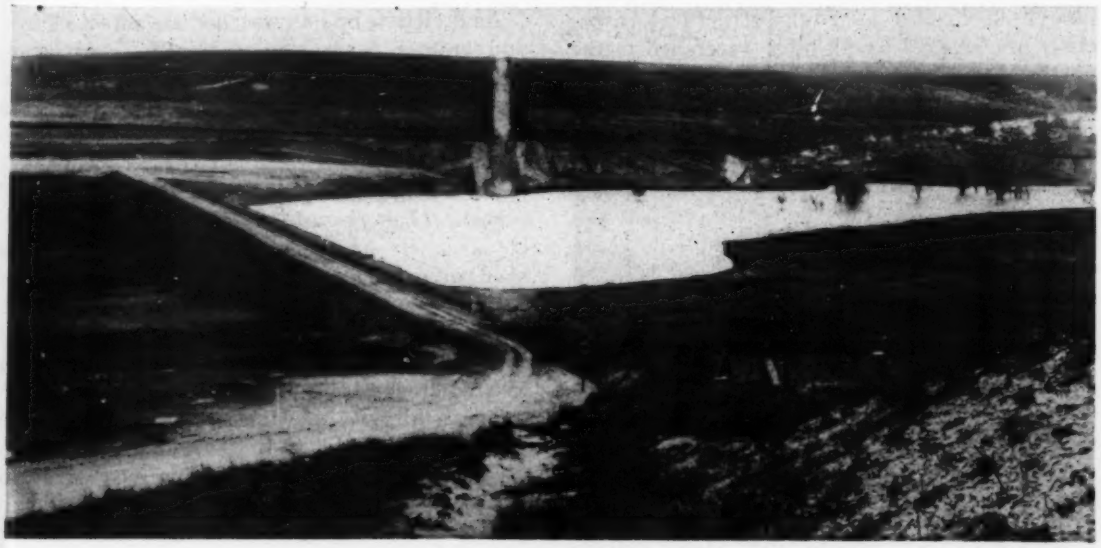
The farmers involved include: Joe Kulich, a supervisor of the Lincoln County Soil Conservation District; Henry Mueller, who gave the land for the reservoir; Adolph Kulich, who donated the land for the dam site; and Ernest Kulich, Albert Holle, and John Hynes, all of whom owned land in the small watershed. With a minimum of entanglements, each of these neighbors contributed what he thought was his fair share—considering the benefits to be expected.

Several years ago one farmer had given some thought to building a dam near this site, but nothing ever came of the project. In August of 1956, Joe Kulich suggested the plan for the project to a group of his neighbors at a regular monthly supervisors meeting. Local Soil Conservation Service technicians were called upon to make a topographic survey of the area. A survey of the 2,650 acre (70 percent in grass) drainage area was made from September through November. The project seemed feasible.

SCS designed the structure and prepared the specifications, with the farmers' needs and wants in mind. The floodwater storage will provide for 1¾ inches of runoff from the entire drainage area above the structure. A 240 foot wide emergency spillway was designed. A 24-inch reinforced concrete culvert runoff pipe serves as the primary spillway. In addition, an 8-inch drawdown pipe, with gate valve, feeds horizontally into a 36-inch riser. 12 feet below the normal water level. This way the flow of water can be regulated—stock water and even some irrigation water may be released from the permanent pool during droughts. Furthermore, the lake makes a wonderful wildlife and recreational area for the farmers and their neighbors.

"Regardless of the flood control, the dam in itself is a good thing. It should keep that water up there where it belongs," Holle commented.

Before the dam was built, a road ran down into the creek and farmers could not get



Highland Dam.

through after a heavy rain. Now a road, which is officially closed but maintained by the county for the farmers, runs over the dam. The county receives its greatest benefit in the protection of the gravel road immediately below the dam. Running south out of Sylvan Grove, the road is a connecting link to U. S. Highway No. 40.

As the Soil Conservation Service technicians did the necessary survey work and staked out the structure, the farmers started getting estimates from contractors and on materials. Also, they worked out arrangements with the county commissioners.

The heavy equipment was moved on the site December 3. Farmers showed up and began to install the 90 feet of 24-inch runoff pipe. Coming in 6-foot sections, the concrete pipe was made watertight with rubber gaskets and rubber cement at the joints. A concrete cradle was poured to serve as a base and keep the 24-inch runoff pipe in alignment. Twenty-two feet of corrugated metal pipe extends the outlet at the lower end.

Soil Conservation Service Engineer, Denneler, worked side by side with the farmers installing the pipe and riser. The group made themselves useful in many other ways to keep down the cost. Because of the good cooperation of all, the project was completed December 28, in less than 1 month's time.

This group of farmers had observed the benefits of floodwater-retarding structures, especially on the Lost Creek pilot watershed in the northern part of Lincoln County. They decided they needed such a dam. They didn't want to wait for it. So they pooled their resources and set out to see what aid they could get. Thanks to ACP, SCS, the county government, and others they got their dam less than 5 months after the time they first agreed to build it. They have named it "Highland Dam."

Farmers and SCS technicians laying 24-inch concrete pipe for principal spillway of Highland Dam.

DISTRICT PROFILE

L. L. MALES of OKLAHOMA

FEW groups in Oklahoma, Kansas, or Texas think these days of starting a watershed project without asking L. L. (Red) Males to have a hand.

Males is the Cheyenne, Okla. bank president and farmer whose story of the Sandstone Creek Watershed in the Washita River flood-prevention project has claimed the fascinated attention of audiences the Nation over.

Obviously, no one in Oklahoma is better qualified to talk on the subject. Males has lived all his life in the district in which he has been a soil conservation district supervisor for the past 18 years.

As a citizen he has watched the effect of soil and water conservation on the life of his community. As a banker he has noted its effect on business. As the operator of a 3,000-acre farm and ranch he has practiced conservation in all of its ramifications.

As a neighbor he has seen the benefits conservation has given to men he has known since boyhood. He has seen the changes the watershed program has made in once powder-dry Sandstone Creek, and he reports the contrast between this sparkling, flowing stream with that of the still-parched beds of nearby untreated creeks.

For a glimpse of Males in true proportion you should go back to the boyhood he spent on a sandhill farm in Reydon community in what is now a part of the Upper Washita Soil Conservation District. This area has been one of the most hazardous in Oklahoma's agriculture.

Wind and water erosion both are a constant threat to the land. Rainfall is erratic. The inherent fertility of the soil is low.

Males got into banking by the side door, you might say. He got a job as janitor of the Strong City Bank to help pay his way in high school. Now, he is president of this same bank —the Security State Bank of Cheyenne.

Before the soil- and water-conservation movement came into being, and the Upper Washita Soil Conservation District was formed, Males was fostering the conservation idea by furnishing farm levels and terracing equipment to farmers who wished to do their own conservation work.

He already had been a force in getting citizens interested in the big Washita Valley move toward flood prevention. And when the Soil Conservation Service was established and the Upper Washita District was organized, Red Males was ready to give both a push.

He is secretary of the Washita Valley Flood Control Council after having served repeated terms as the council's chairman. He has served several times as chairman of his soil conservation district and now is vice chairman.

Secretary of Agriculture Benson recognized his ability by naming him, in 1954, a member of the 18-man Advisory Committee on Soil and Water Conservation. More recently Governor Gary appointed Males to a 6-year term on Oklahoma's new Water Resources Board.

Males has given his color-slide lecture on upstream flood prevention and Sandstone Creek nearly 100 times. He has driven many thousands of miles on such assignments, usually paying his own expenses and nearly always, if the meeting is in Oklahoma, driving back to Cheyenne during wee hours of the night.

He has given his lecture before cabinet members and congressional committees, before national meetings of the Farm Bureau Federation, Friends of the Land, National Association of Soil Conservation Districts, and countless other groups.

Frequently Mrs. Males, whom he calls "a soil conservation widow", or their older son, Jim, is called upon to operate Males' slide projector. Sometimes it is a volunteer from the audience. Recently it was a visiting missionary from India, Forest Conser, of Bombay State, who had called on Males to learn of upstream flood prevention techniques.

L. L. (Red) Males

Males starts his lectures by explaining: "I am just a country banker. I'm not an expert in any way in soil and water conservation. . . ." And after that simple introduction his audience becomes transfixed as the tale of achievement in one small watershed unfolds.

Males' voice is soft and seldom raised. His manner is one of patience, and he shows a willingness to hear the other side of an argument. Only when someone questions the value of watershed conservation and development, or expresses doubt that a community has the resources to do the work, is his voice apt to assume a dominant pitch and the hand close, to drive home a point in support of his favorite argument.

Red Males keeps saying he must turn some of the "missionary" work in upstream flood prevention over to other folks. It is taking too much of his time. Yet, you know as he says it, this will be a tough thing for him to do. Watersheds and soil conservation have become too much a part of his life.

—TARLETON A. JENKINS

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REVIEWS

GRASSLAND SEEDS. By W. A. Wheeler and D. D. Hill. 734 pp. Illustrated. 1957. New York: Van Norstrand Co., Inc. $12.50

THERE has been a growing demand for this book as grassland seeds play an ever-increasing and important role in agriculture. Until the latter part of the 19th century, grassland seeds were the product of the hay mow. Today, they are a specialty crop, produced and marketed by a well-organized seed industry. The authors relate how an awareness of the need for grass seed grew in this country after the ravages of soil erosion were noted. The many techniques, skills, and facilities in this field of endeavor are presented in a well-organized and an interesting manner.

Several chapters contain helpful information on how to select a potentially profitable crop, what fertilizers to use, when to harvest, and how to choose and operate the equipment best suited for the particular crop. The delicate business of seed drying, processing, and storing the seed without impairing its quality is discussed in considerable detail. Marketing of seed is also given considerable space.

A large part of the book is devoted to a discussion of the principle legumes and grasses as specific grassland crops. Each one is treated as to its importance as a crop, seed traits and characteristics, management for seed production, seed harvesting and cleaning, and statistics on yield and production.

An appendix, of 100 pages, contains such useful items as a glossary of technical terms, tables and plates of nearly 400 species and varieties that give the number of seeds per pound, purity, viable seed, longevity, and sowing-rate per acre. "Field seed statistics" give the acres harvested, yield, and supply of the principle grassland seeds. "Screens and screening suggestions for cleaning commercial grassland seeds" provide useful information to one interested in furnishing high-quality seed for the market. "Seed Certification Standards" aid the grower in meeting the requirements set for producing quality seed.

In a final chapter, the authors call attention to "Seed Improvement" in which the breeder, grower, producer, processor, and distributor represent the facets of the seed industry referred to as the "Seed Trade."

This book, written by two eminent authorities on the subject, is a worthwhile contribution to American agriculture. The seed grower, the technician, the seed vendor, will all find useful and up-to-date information that should contribute to well-planned production, stocking, distribution, and improved use of grassland seeds.

—A. D. STOESZ

INVEST AND IMPROVE.—From 1946 to 1956, farmers in the United States spent about $45 billion on major improvements and additions to plant and equipment. This was about $14 billion more than the estimated $31 billion required to cover depreciation.

OUR COMMON GOAL remains that of getting still needed conservation practices on the land as fast as possible, consistent with obtaining a full measure of sound and lasting conservation for each dollar of public or private money spent. In doing so, we have to stick to the basic principles that have proved themselves over the years. The expanding watershed and other approaches to our resource conservation problems, in fact, intensify the importance of soil surveys to determine land capabilities, of acre-by-acre conservation farm planning, and of treatment and use of all our lands within their needs and capabilities.

—D. A. WILLIAMS, *Administrator*
Soil Conservation Service